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FAST GROWTH FROM SOLUTIONS: MECHANISMS AND DEFECTS

I.V. Alexeev*, J.J De Yoreo**, L.N.Rashkovich***
* Institute of Crystallography, Russian Acad. Sci.
** Lawrence Livermore National Laboratory
***Physics Department, Moscow State University

Considerable increase in the rate of crystal growth from solution without reduction in crystal quality is possible using high levels of supersaturation, s. Growth of KDP and ADP crystal faces at supersaturations of up to 17% was investigated. Dislocation hillocks remain on the faces even at the maximum s, but at s > 8-10%, 2-dimensional nuclei are generated on the terraces between steps. Their generation is followed by a reduction in hillock slope. The shape of hillocks on the prism and bipyramid faces has been described. Use of atomic force microscopy made it possible to image hollow channels surrounding dislocation sources with Burgher's vectors larger than one unit step. Because the dislocation spiral has to by-pass these channels, their presence lowers the activity of sources at high s. The shape of a polygonal spiral was computed taking into account the by-passing of the channel and the tensions in the dislocation core. The effect of impurities on the shape of elementary steps, generation of macrosteps and the relation of these factors to the quality of crystals has been researched theoretically and experimentally. Applying in situ Michelson interferometry, the effect of Fe, Cr, and Al-ions and organic impurities on the dependence of the effective tangential step speed, v on s has been investigated. The results show that it is possible to increase the normal growth rate of prismatic faces at constant s by reducing the content of these impurities or decreasing the pH. The positive effect of crystallization growth temperature on the stability of highly supersaturated solutions and reduction of impurity adsorption has been demonstrated.

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